CLAIMS

1. A method for customizing a transition zone for a refractive ophthalmic treatment comprising:

measuring a curvature of a pre-operative cornea;

developing a programmed ablation depth profile in a transition zone, where the programmed ablation depth profile will produce a continuous curvature on the surface of a post-operative cornea, where the curvature will be continuous throughout the transition zone thereby minimizing curvature discontinuities.

2. The method of claim 1, wherein the transition zone is larger than or equal to a conventional transition zone.

3. The method of claim 1, wherein more tissue is removed than in a conventional transition zone to facilitate reducing the biomechanical response.

4. The method of claim 1, wherein said measuring a curvature of a pre-operative cornea includes receiving perturbation data concerning the pre-operative cornea on which the refractive ophthalmic treatment will be performed.

5. The method of claim 4, wherein the perturbation data is both pre-perturbation and post-perturbation data, and comprises at least one of a topographic data, a pachymetric data, an elevation data, a total corneal thickness data, a corneal curvature data, a wave-front data, and an intraocular pressure data.

6. The method of claim 5 wherein perturbation comprises one of a corneal incision, a corneal ablation, a LASIK flap cut, an ultrasonic measurement, and peeling the epithelial layer from the cornea.

7. A computer readable medium storing computer executable instructions operable to perform the method of claim 1.

8. A system for customizing a transition zone of an ablation pattern for a refractive ophthalmic treatment for a cornea, comprising:

a data receiver for receiving a corneal data; and

a transition zone designer adapted to produce the customized transition zone with a continuous curvature which eliminates curvature discontinuities at or near the edge of a post-operative optical zone and whose effects minimizes the biomechanical response in the post-operative cornea.

9. The system of claim 8, where the corneal data comprises at least one of topographic data, pachymetric data, elevation data, total corneal thickness data, corneal curvature data, wave-front data, and intraocular pressure data, said corneal being measured before a cornea is processed by at least one of a cut, an ablation, an ultrasonic measurement, and a peeling of a corneal epithelial layer.

10. The system of claim 8, where the corneal data comprises at least one of topographic data, pachymetric data, elevation data, total corneal thickness data, corneal curvature data, wave-front data, flap thickness data, and intraocular pressure data, said corneal data being measured after a cornea is processed by at least one of a cut, an ablation, an ultrasonic measurement, and a peeling of a corneal epithelial layer.

11. A computer readable medium storing computer executable components of the system of claim 8.

12. A method to facilitate an increased functional optical zone with a customized transition zone pattern of continuous curvature, where the corrective properties of the transition zone are included in the ablation zone pattern design, said method comprising:

receiving pre-operative data concerning a cornea on which a refractive ophthalmic treatment will be performed;

subtracting the programmed optical zone correction from corneal measurements provided in the pre-operative data to provide the predicted location of the post-operative optical zone edge;

calculating the predicted curvature at and/or near the edge of the optical zone after application of the programmed optical zone correction;

calculating based, at least in part, on the pre-operative data received and the predicted curvature at the edge, a customized transition zone pattern which addresses curvature discontinuity by eliminating its occurrence in and/or near the programmed optical zone; and

applying the calculated transition zone to the ablation zone pattern.

13. The method of claim 12 wherein said pre-operative data, in part, is used to determine a programmed optical zone correction used in the ablation zone pattern.

14. The method of claim 12 wherein said pre-operative data includes, at least one of topographic data, pachymetric data, elevation data, corneal thickness data, corneal curvature data, wave-front data, and intraocular pressure data, where such data is associated with the cornea before and/or after perturbation.

15. The method of claim 14 wherein said perturbation comprises one of a corneal incision, a corneal ablation, a LASIK flap cut, an ultrasonic measurement, and peeling the epithelial layer from the cornea.

16. The method of claim 12 wherein said method uses a curve fitting algorithm to generate a transition zone with a continuous second derivative along a profile of the cornea outwardly from the programmed optical zone correction.

17. The method of claim 16 wherein said curve fitting is selected from the group comprising one of spline fitting, arc-step fitting, least-squares fitting, and non-linear least squares fitting.

18. The method of claim 12 further comprises receiving post-perturbation data which includes, at least one of topographic data, pachymetric data, elevation data, corneal thickness data, corneal curvature data, wave-front data, and intraocular pressure data, where such data is associated with the cornea after perturbation.

19. The method of claim 18 wherein said perturbation comprises one of a corneal incision, a corneal ablation, a LASIK flap cut, an ultrasonic measurement, and peeling the epithelial layer from the cornea.

20. The method of claim 12 further comprises taking corneal measurements, which are taken by methods including, but not limited to, corneal topography, optical coherence tomography, ultrasound, refraction, and/or wave-front analysis.